Cooperative Climate Change R&D That Works

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OVERVIEW

Developments in international climate policy over the past five years have broadened the scope of technology policy in contributing to mitigation goals. Beyond the traditional model of technology transfer, new efforts have sought to deepen the level of cooperation between countries in accelerating innovation. Some of this activity has occurred in a multilateral context with open participation, such as the coordinated research and development (R&D) goals set under the Mission Innovation initiative announced at COP21. Other forms of cooperation occur in limited-member "clubs," such as the International Energy Agency's Implementing Agreements. Finally, bilateral agreements for R&D collaboration have been started between many country pairs, for example the U.S.-China Clean Energy Research Center and the U.S.-India Joint Clean Energy Research and Development Center.

International cooperation provides the opportunity to accelerate innovation while also broadening access to and deployment of new inventions. However, these efforts also face multiple roadblocks in implementation. Here we propose a set of five key principles to establish cooperative R&D arrangements. We believe following these principles will lead to the formation of cooperative R&D arrangements which will enjoy the advantages of collaboration while bypassing many of the potential barriers.

WHY COLLABORATE?

The primary objective for international collaboration in innovation is to provide access to knowledge spillovers and enhance the speed of cumulative innovation[1] by broadening access to these spillovers. Countries possess very heterogeneous skills and resources needed for climate change innovation. This heterogeneity is rooted in differing scientific capacity and capacity to perform "innovation system functions,"[2] differing patterns of industrial development, and historical investment in differing technology areas.

Innovation in any technology area creates a global public good. Therefore, cooperation can create incentives for countries to increase their investment in innovation,[3] as demonstrated by the Mission Innovation pledges. These incentives may prove critical in raising the overall level of global climate change innovation investment above its currently inadequate level.[4,5] In addition, innovation collaboration may also be beneficial by enabling larger R&D projects that capitalize on economies of scale[3] and reducing information asymmetries that cause inefficient or duplicative effort.

Access to technologies for climate mitigation, like other technologies that provide a global public good, is limited. This is because the interests of those who develop and control such technologies do not necessarily align with the interests of the beneficiaries who may lack the economic, political, or social capital to incentivize broader access.[6] When innovation occurs in collaborative arrangements, access to technologies is likely to be shared among all partners. This broadens access to new inventions relative to unilateral R&D efforts, although it may not necessarily make the fruits of innovation fully accessible where technology is most needed.

Despite their potential, in recent experience, collaborative R&D arrangements have fallen short. As relatively new institutional arrangements, collaborative R&D efforts have experimented with alternate modes of governance and management, but have struggled to overcome a lack of trust between countries. In particular, unfamiliarity with foreign laws and culture, little joint communication, and not fully understanding the intellectual property management for joint projects has hindered the performance of existing collaborative R&D arrangements.[7–9]

PRINCIPLES FOR COOPERATION

Here we propose five key principles that can be used to design a successful cooperative organization that overcomes the main obstacles current cooperative R&D efforts experience. These key principles focus on implementing arrangements to increase the level of risk-taking in R&D, broaden participation by the private sector, and create stable win-win incentives for both parties to an agreement.

Cooperation on the Basis of Comparative Advantage

Cooperative agreements create the greatest benefits when they capitalize on the comparative advantages of participants. There are many dimensions of potential comparative advantage within cooperative R&D arrangements, including in research capacity, markets, and complementary infrastructure. Effective cooperative arrangements should seek to marry the complementary advantages of different countries. Cooperative arrangements should also consider existing participant country expertise in specific technology strains when selecting new R&D areas. Importantly, cooperative arrangements should seek to bring together researchers from different, localized backgrounds. Creating research teams with multiple perspectives are more likely to lead to breakthroughs.[10,11]

Private Sector Engagement

In order for collaborative R&D arrangements to be effective, adoption of technologies in the domestic markets of participants should be given priority.[12] A key strategy to accelerate commercialization and adoption of technologies in collaborative R&D efforts is to increase the participation of the private sector. Meaningful engagement of the private sector may require incentivizing participation by making technology benefits tangible, such as providing advance market commitments. Private sector engagement may also strengthen the political support needed to create a stable environment for long-term public investment and create the conditions needed for high-risk, high-reward R&D.[13]

Practical Implementation Ingredients

Deep engagement between scientists from different countries is crucial to effectively deliver on the potential of collaborative R&D arrangements. Lessons from managing common-pool resources[14] apply to managing collaborative R&D arrangements: there should be frequent face-to-face communication, proper monitoring of project progress, and transparency in decision making and result sharing. Achieving these objectives may require in-depth negotiations on the specific design elements of a collaborative research center, see for example the process to develop the Technology Management Plan of the US-China Clean Energy Research Center.[9]

Providing More Authority to the Scientists

When scientists have the authority to direct their research, higher-risk, higher-reward research tends to be selected.[15] When the authority for collaboration is placed on governments with little trust in collaboration, providing more authority to scientists could create a more trusting environment driven by scientists that share a common scientific culture. Collaboration between governments with low levels of trust should provide more authority to scientists to overcome this barrier to collaboration.

Cooperating Bilaterally

The potential for free-riding and non-compliance in existing cooperative R&D efforts is uncertain. Some countries may find the indirect costs of participation too high relative to the uncertain innovation outputs.[12] These challenges are likely to be greater with a larger number of participating countries. Bilateral cooperation has the ability to narrow the complexities regarding cost-sharing and benefit-sharing while also enhancing the potential for creating a high-trust environment where knowledge can be freely exchanged. Based on the simplicity of bilateral agreements compared to plurilateral and multilateral arrangements, there is a greater potential to expedite innovation while avoiding the complexities that can arise in larger plurilateral or multilateral collaborative agreements.

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The views expressed in this brief are the views of the authors and not the University of Minnesota or the Center for Science, Technology, and Environmental Policy. We hope to contribute to the dialogue on developing a post-2020 international climate policy architecture and welcome all comments. **A full paper discussing the ideas in this brief will be available soon. Please contact gabechan@umn.edu for a copy.**